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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,159	01/15/2002	Daniel Yap	B-3752DIV 619413-2	2922

7590 03/18/2003
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EXAMINER

THAI, LUAN C

ART UNIT PAPER NUMBER

2827

DATE MAILED: 03/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/053,159		YAP ET AL.	
	Examiner		Art Unit	
	Luan Thai		2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-31 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 21-31 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. This application appears to be a division of Application No. 09/522,803, filed 03/09/00, Pat. 6,387,793.

Information Disclosure Statement

2. The information disclosure statement (IDS) filed on 01/15/02 has been considered by the examiner.

Oath/Declaration

3. The declaration filed 01/15/02 is acceptable.

Abstract

4. Applicant is reminded of the proper language and format for an abstract of the disclosure

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet *within the range of 50 to 150 words*. It is important that the abstract *not exceed 150 words in length* since the space provided for the abstract on the computer tape used by the printer is limited. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

Claim Objections

5. Claims **23** and **29** are objected to because of the following informalities:

In claim **29**, the recitations "said insulating film" in line 2, and "said sealant feature" in line 3, should be changed to --an insulating film--and --a sealant feature--, respectively.

In claim **23**, the recitations of "a group consisting of elements of *Period IV of Periodic Table*", "a group consisting of elements of *Period III of Periodic Table*", and "a group consisting of elements of *Period V of Periodic Table*" are unclear since *the Periodic Table* does not contain *Periods III, IV, and V, but Periods III-A, III-B, IV-A, IV-B, V-A, or V-B*.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 21-23, and 25-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Mis et al (5,767,010 Applicant admitted prior art).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 21-23, and 25-27, Mis et al (see specifically figures 4-5-6 and 10-11-12) disclose a solder bump structure for use on a substrate 22 made of materials from group III-A - V-A of the Periodic Table (Col. 3, lines 49+), comprising: a multiplayer under bump metallurgy 32-33-34 (Col. 4, lines 17+ and lines 50+); a thin layer of titanium 28 having a thickness about 500 Angstroms (Col. 4, lines 3+) deposited under and adjacent to the multiplayer under bump metallurgy 32-33-34 (Col. 4, lines 11+ and lines 48+); a solder bump 42/54 on top of the multiplayer under bump metallurgy 32-33-34, wherein the solder bump 42/54 comprises an alloy of tin and lead (Col. 5, lines 41+ and Col. 7, lines 54+); an insulating film 26 comprising of polyimide and silicon nitride (Col. 3, lines 57+) arranged under the multiplayer under bump metallurgy 32-33-34.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mis et al (5,767,010 Applicant admitted prior art) in view of Kung et al (6,179,200).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claim 24, Mis et al disclose all the limitations of the claimed invention as detailed above except for the multiplayer under bump metallurgy

further comprising: a titanium layer with a thickness within a range 0.02-0.05 micrometers; a nickel layer with a thickness within a range 0.5-1.0 micrometers; and a gold layer with a thickness within a range 0.05-0.2 micrometers.

Titanium, nickel, and gold, however, are known materials in the art, specifically in UBM or BLM art, for forming multiplayer under bump metallurgy of adhesive layer, barrier layer, and solder wettable layer, respectively, as taught by Kung et al (Col. 1, lines 35+ and lines 43+). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the well known materials (e.g., Titanium, nickel, and gold), as taught by Kung et al, to form multiplayer under bump metallurgy in Mis et al's solder bump structure, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Although the proposed bump structure of Mis et al and Kung et al does not teach exactly the thickness of the adhesive titanium layer (e.g., 0.1 micrometers instead of 0.02-0.05 micrometers as claimed) and of the solder wettable gold layer (e.g., 0.3 micrometers instead of 0.05-0.2 micrometers as claimed), it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the adhesive titanium layer and the solder wettable gold layer in the ranges as claimed because the dimension (e.g., thickness) of a conductive layer is an art recognized variable of importance which is subject to routine experimentation and optimization. (See Kung's Col. 1, lines 38+).

10. Claims 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mis et al (5,767,010 Applicant admitted prior art) in view of Greer (6,451,681).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 28-31, Mis et al disclose all the limitations of the claimed invention, including an insulating film of polyimide 26 arranged under the multiplayer under bump metallurgy 32-33-34, as detailed above except for a sealant feature made of titanium with a thickness between about 0.02 and 0.20 micrometers and arranged between the multiplayer under bump metallurgy and the insulating film.

Greer while related to a similar solder bump structure design teaches (see specifically figures 5-6) a sealant feature 504 made of titanium with a thickness about 0.20 micrometers (e.g., 200 nanometer) being arranged between the multiplayer under bump metallurgy 600-602-604 (e.g., layer 608) and the insulating film of polyimide 502, in order to form a transitional metallurgy layer in a solder bump structure (Col. 5, lines 43+ and lines 63+, Col. 3, lines 49+ and lines 54+). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Greer's teachings of the sealant titanium layer to Mis et al's solder bump structure in order to have a transitional metallurgy layer between the multiplayer under bump metallurgy and the insulating film.

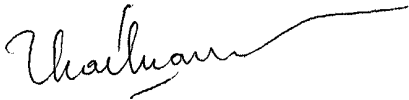
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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan Thai whose telephone number is (703) 308-1211. The examiner can normally be reached on 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A handwritten signature in black ink, appearing to read 'Luan Thai', with a long horizontal flourish extending to the right.

Luan Thai
March 16, 2003